

The Observing System Monitoring Center

Steven Hankin¹, Kevin J. Kern² and Ray (“Ted”) Habermann³

¹ NOAA Pacific Marine Environmental Laboratory, Seattle, WA

² NOAA National Data Buoy Center, Stennis Space Center, MS

³ NOAA National Geophysical Data Center, Boulder, CO

Project Summary

The Observing System Monitoring Center (OSMC) is an information gathering, decision support, and display system for the National Oceanic and Atmospheric Administration’s (NOAA) Office of Climate Observations (OCO) located in Silver Spring, MD. The OSMC permits the many “networks” of *in situ* ocean observing platforms -- ships, floats, tide gauges, etc. -- to be viewed as a single system. It is a key integrating component for the management of a sustained Ocean Observing System for Climate.

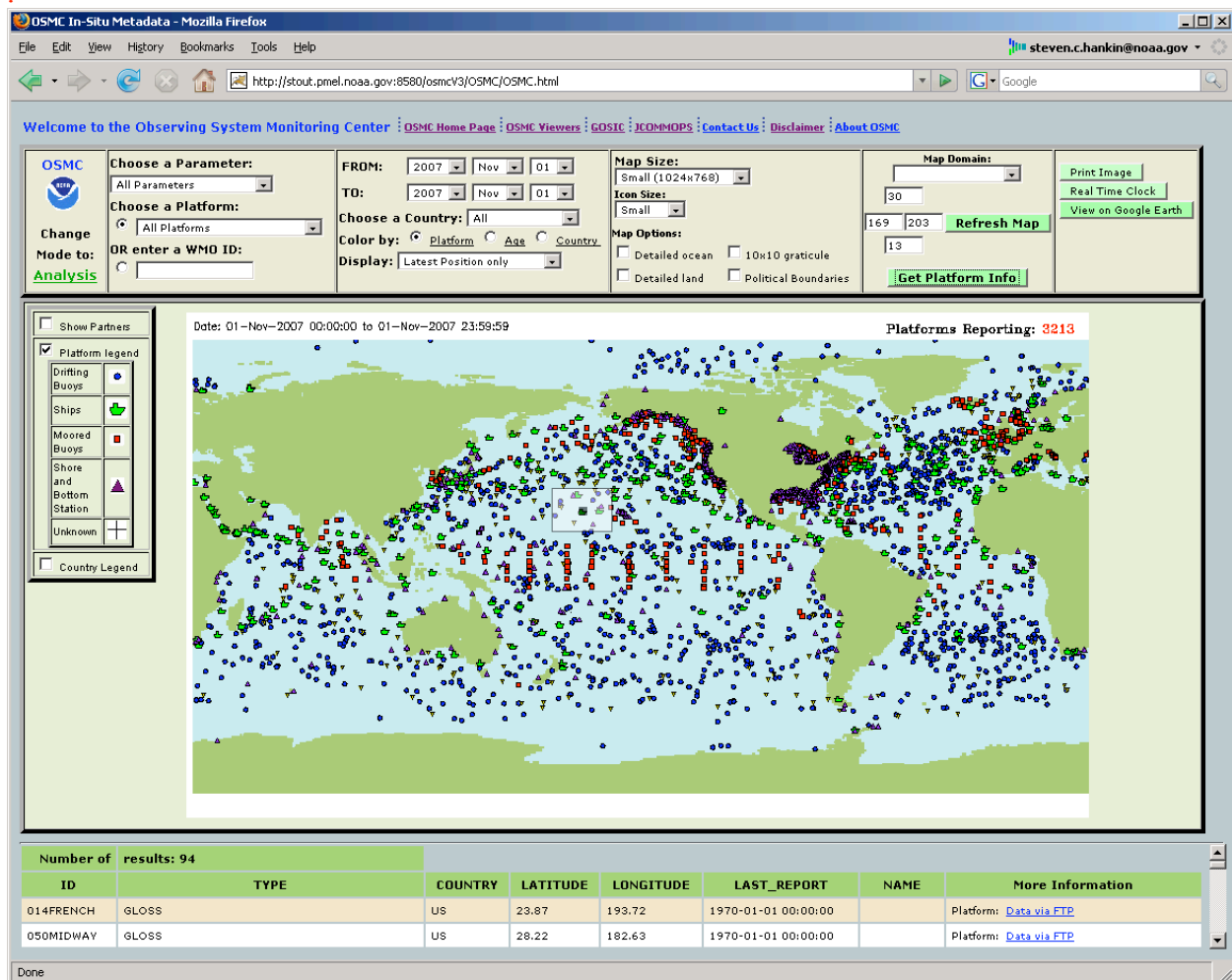


Figure 1. Screen snapshot of OSMC interface

The OSMC system displays the current and historical status of the global observing system for *in situ* ocean surface meteorological and oceanographic measurements (Figures 1, 2). It provides dynamically generated maps to visualize the coverage of observations. The selection of observations may be constrained by observing platform, by parameter (temperature, sea level height, etc.), and by contributing nation. Maps may be requested for various time intervals – daily, weekly, monthly or arbitrary. With a click the user can “drill down” to see the metadata that describes a given observation.

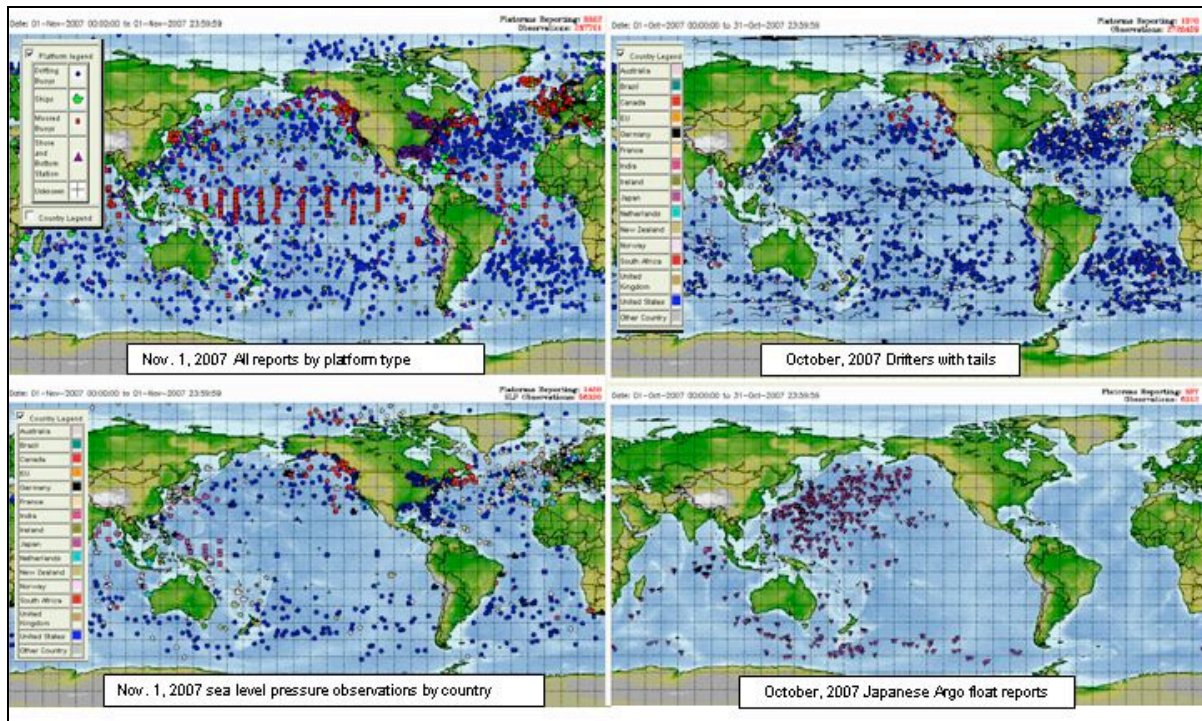


Figure 2. Sample OSMC maps

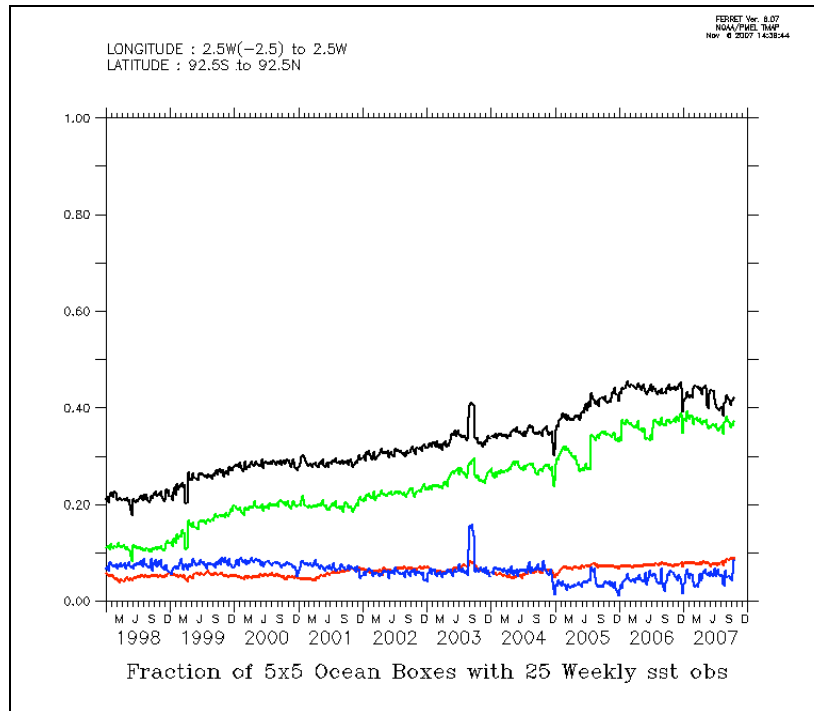


Figure 3. Progress in implementation of the ocean observing system

Other viewers in the OSMC also provide time series showing trends in observing system coverage (Figure 3); they provide tabulated summaries, showing the counts, continually updated, of observations by ocean basin and platform type, and the contributing nation (Figure 4); and they provide visualizations of the observations on a globe (with Google Earth[®]) (Figure 5) and via ESRI ArcIMS[®] tools (Figure 6).

	Argo Floats	CMAN	Drifting Buoys	Moored Buoys	Ships	Unknown	Undefined	Sum
11-08-2007	3	295	1253	358	0	0	0	1909
11-07-2007	124	339	1271	406	0	0	0	2140
11-06-2007	161	337	1268	405	596	47	225	3039
11-05-2007	170	337	1260	410	722	55	271	3225
11-04-2007	144	296	1262	406	717	53	266	3144
11-03-2007	150	298	1262	405	709	53	257	3134
*A count is defined as a platform reporting any type of observation on a particular day.								

Figure 4. One of many OSMC table-based summaries

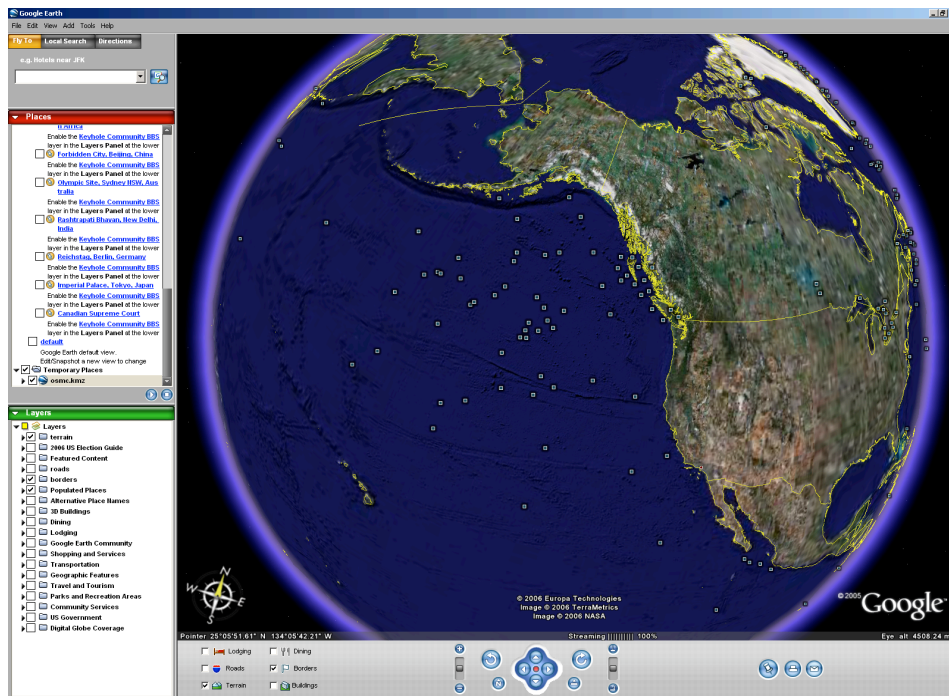


Figure 5. Google Earth® viewer showing ocean observations

The OSMC also offers analysis capabilities, developed through collaborative interaction with the Climate Observing System Council (COSC) and NOAA observing system scientists. These analysis capabilities help managers to assess the adequacy of the observations to compute critical ocean state fields, such as sea surface temperature. Figure 7 shows a 5x5 degree gridded analysis of a simple metric for the adequacy of the sampling of SST – the percentage of weeks in which at least 25 observations are made in a grid box.

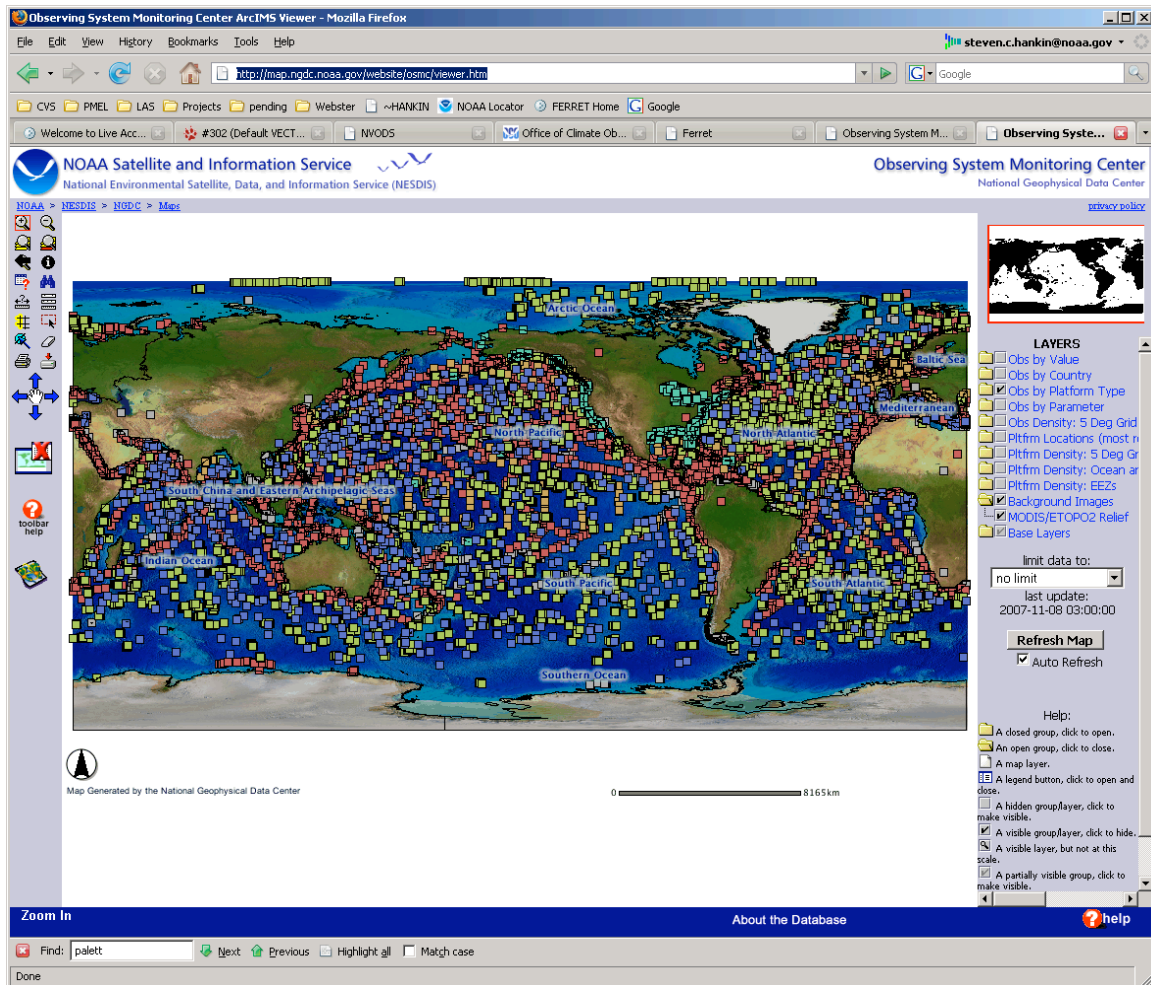


Figure 6. ArcIMS® viewer with observations of the last 10 days colored by platform type

The OSMC system is available on-line at <http://www.osmc.noaa.gov> (note that at the time of this writing a new home page is under construction). It is provided as a resource to other NOAA centers, national research partners, and international partners.

The OSMC project is a joint development effort between the Pacific Marine Environmental Laboratory (PMEL) in Seattle, Washington; the National Data Buoy Center (NDBC) at Stennis Space Center in Mississippi; and the National Geophysical Data Center (NGDC) in Boulder, Colorado. The project is aligned to take advantage of the strengths of each organization. PMEL (an ocean/climate research laboratory) is responsible for the user interface/graphics/analysis tools; NDBC (an operational organization) is responsible for the data; and NGDC (a data center) provides consulting and development services on the use of data bases and GIS interfaces.

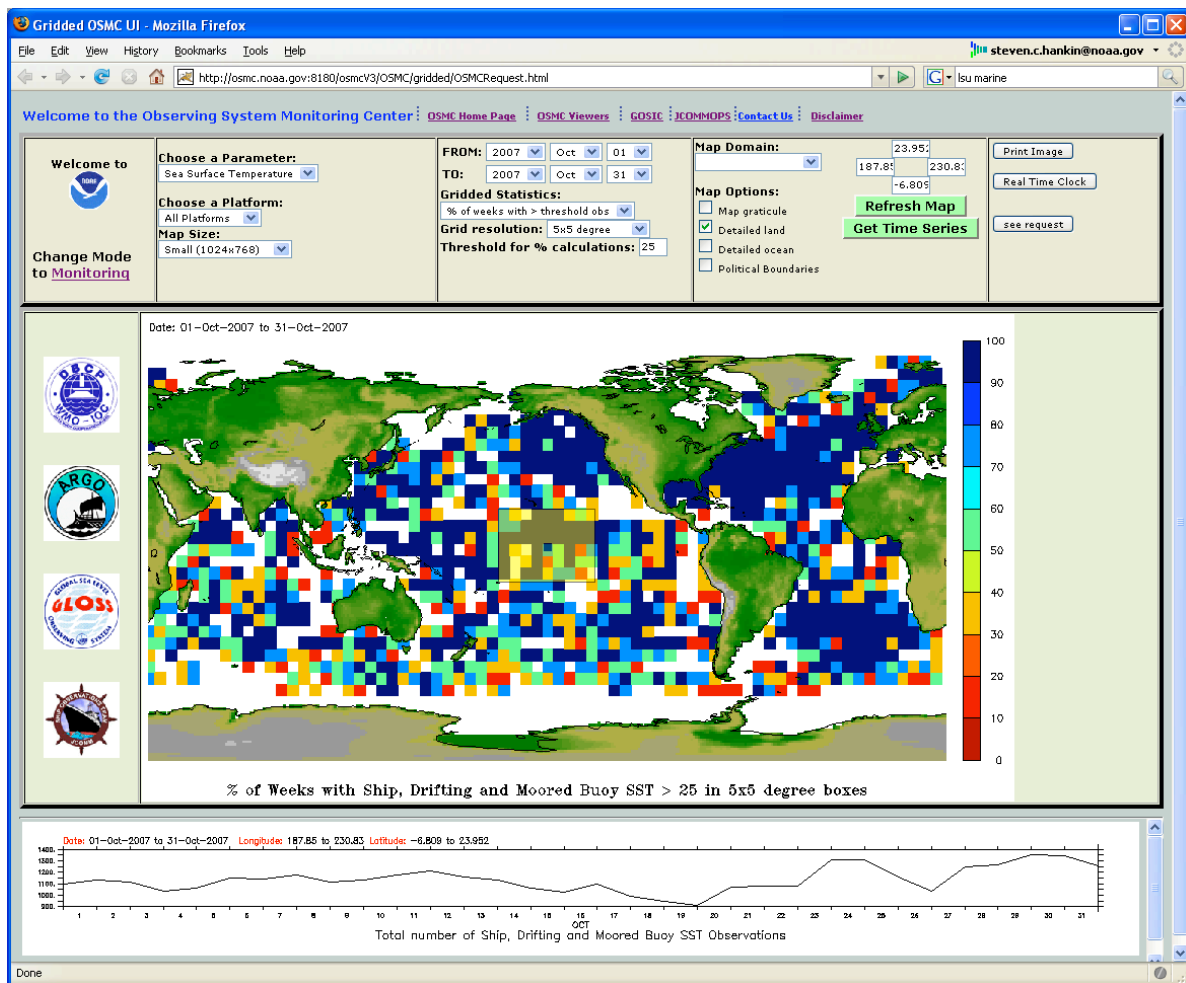


Figure 7. Analysis interface of the OSMC

The OSMC is being designed in close cooperation with the JCOMM in situ Observing Platform Support Centre (JCOMMOPS). The development of the OSMC represents an important step towards the fulfillment of commitments to the Ten Climate Monitoring Principles.

FY2007 Progress

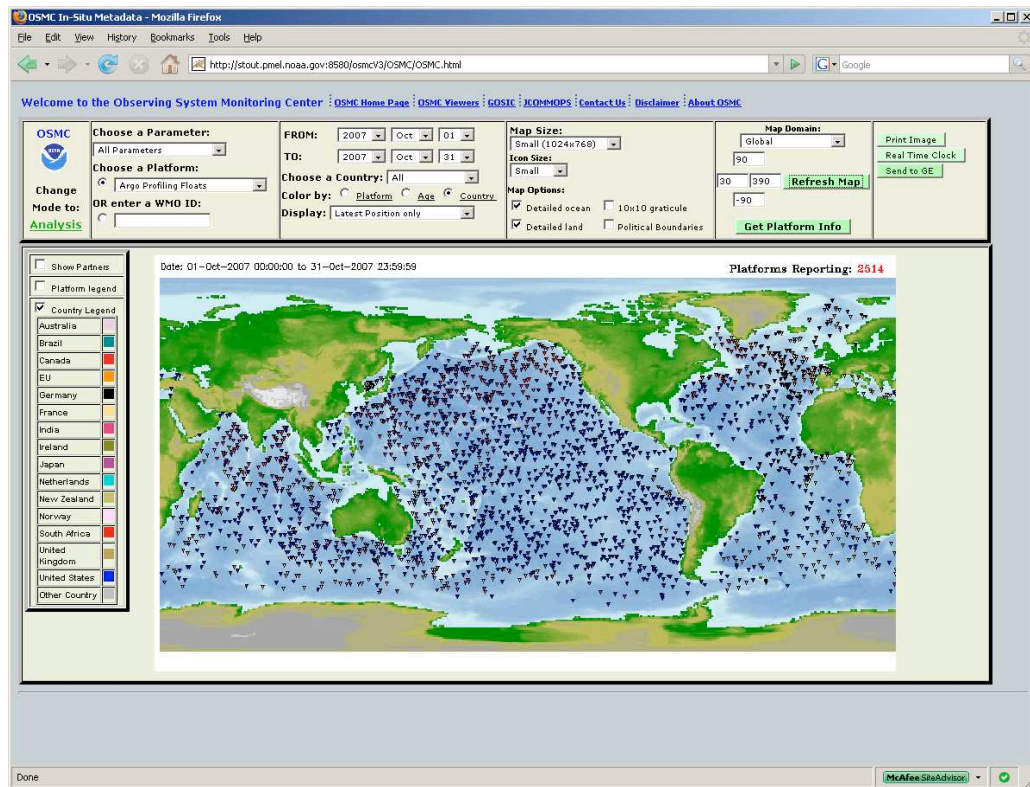
The following milestones track the progress made on OSMC during fiscal year 2007. “Group” lists only those accomplishments or events that involved the entire collaborative group.

Group Accomplishments (PMEL, NDBC, NGDC)

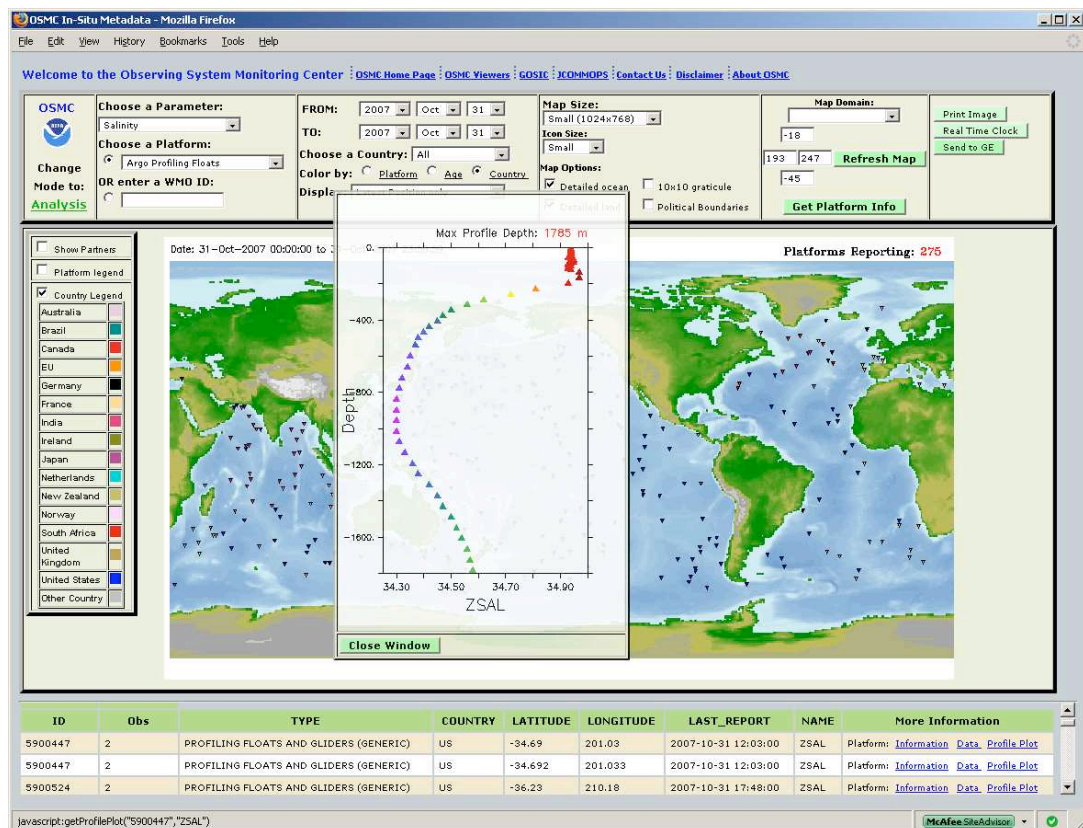
- The OSMC collaboration released the OSMC system through the publicly accessible OCO Web site. The OSMC site was advertised to the Climate Observing System Council (COSC), JCOMMOPS and OCO partners nationally and internationally.
- The group continued to support OCO needs for materials and information needed for initiatives, briefings, presentations, and ad-hoc requirements.
- The group met for an OSMC all-hands meeting July 17-18, Seattle in which progress was assessed, strategic plans and priorities were decided upon, and technical issues that had been identified through weekly telcons were addressed.
- During the July 2007 meeting at PMEL decisions were taken to advance the OSMC system towards “version 3”. Version 3 will incorporate a new primary “feed” for the OSMC data and metadata (an important step toward making the OSMC the “gold standard” for ocean observing system metadata); new database design; and major enhancements to the OSMC products and LAS user interface to support visualization and analysis of the observing system. A functioning “beta” of version 3 was hosted at NDBC and made available to the OCO (though not linked to the OSMC home page) on Oct. 11. Most new features in this server represent the shared contributions of the entire collaboration – database structure and queries from NGDC; database content from NDBC; and delivery of that information through the LAS OSMC user interface by PMEL.

PMEL Accomplishments

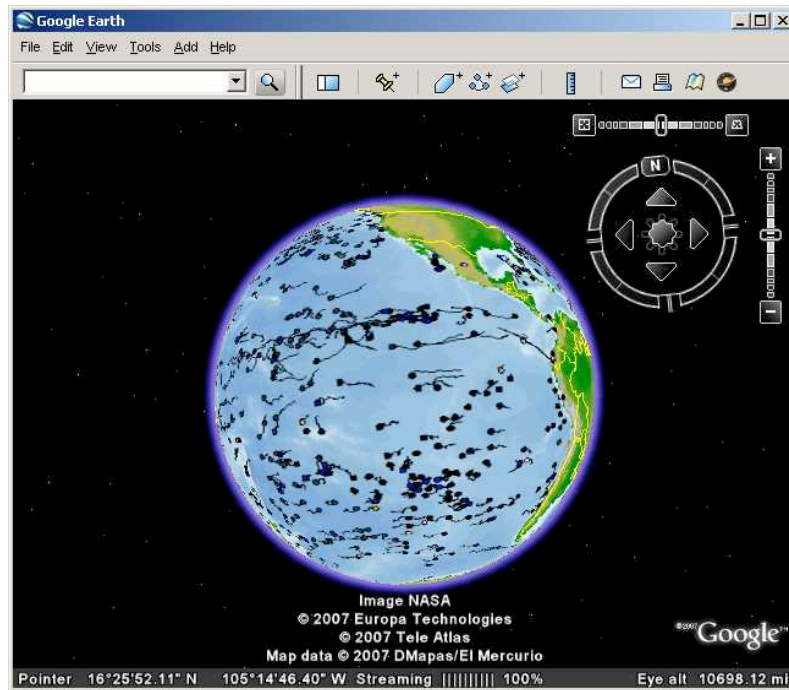
- PMEL met its on-going project leadership responsibilities for the OSMC collaboration: organizing meetings and telcons; overseeing the tracking of bug fixes, milestones, and deliverables; coordinating plans of high level strategy; helping to ensure that group-wide communications continue to flow smoothly. PMEL also continued to provide the primary (though by no means sole) point for coordination of OSMC developments and outreach with projects such the Integrated Ocean Observing System (IOOS); the NOAA Data Management Committee (DMC); the NOAA “GEO-IDE” data integration framework; and NOAA science programs.
- In the Oct. 11 “beta” release of OSMC version 3 the new features that were added by PMEL include
 - Maps of "Latest position" such as this example, which shows the last reporting position of all Argo floats that reported during the month of October, 2007.



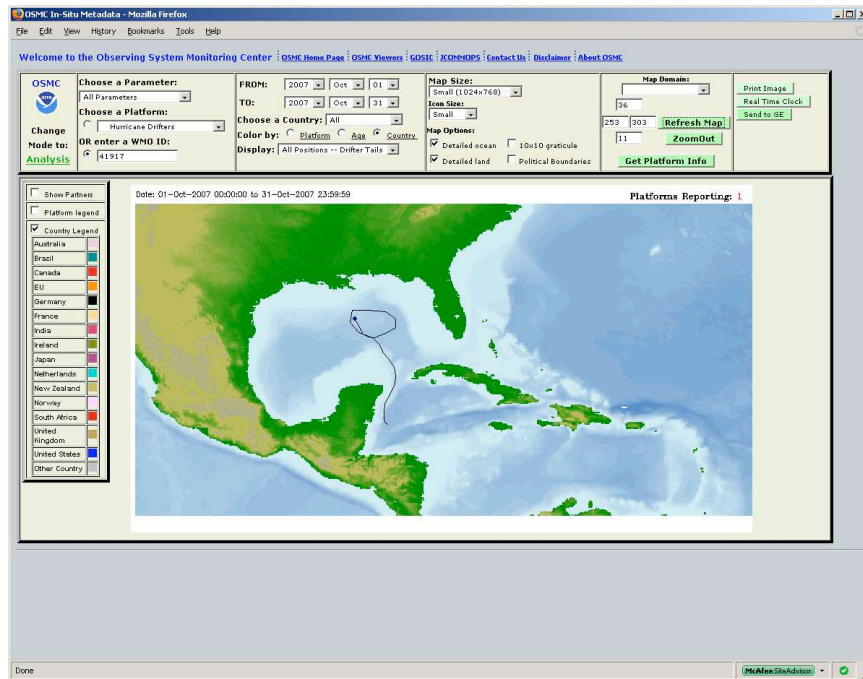
- Beta release of the visualization style for profile observations



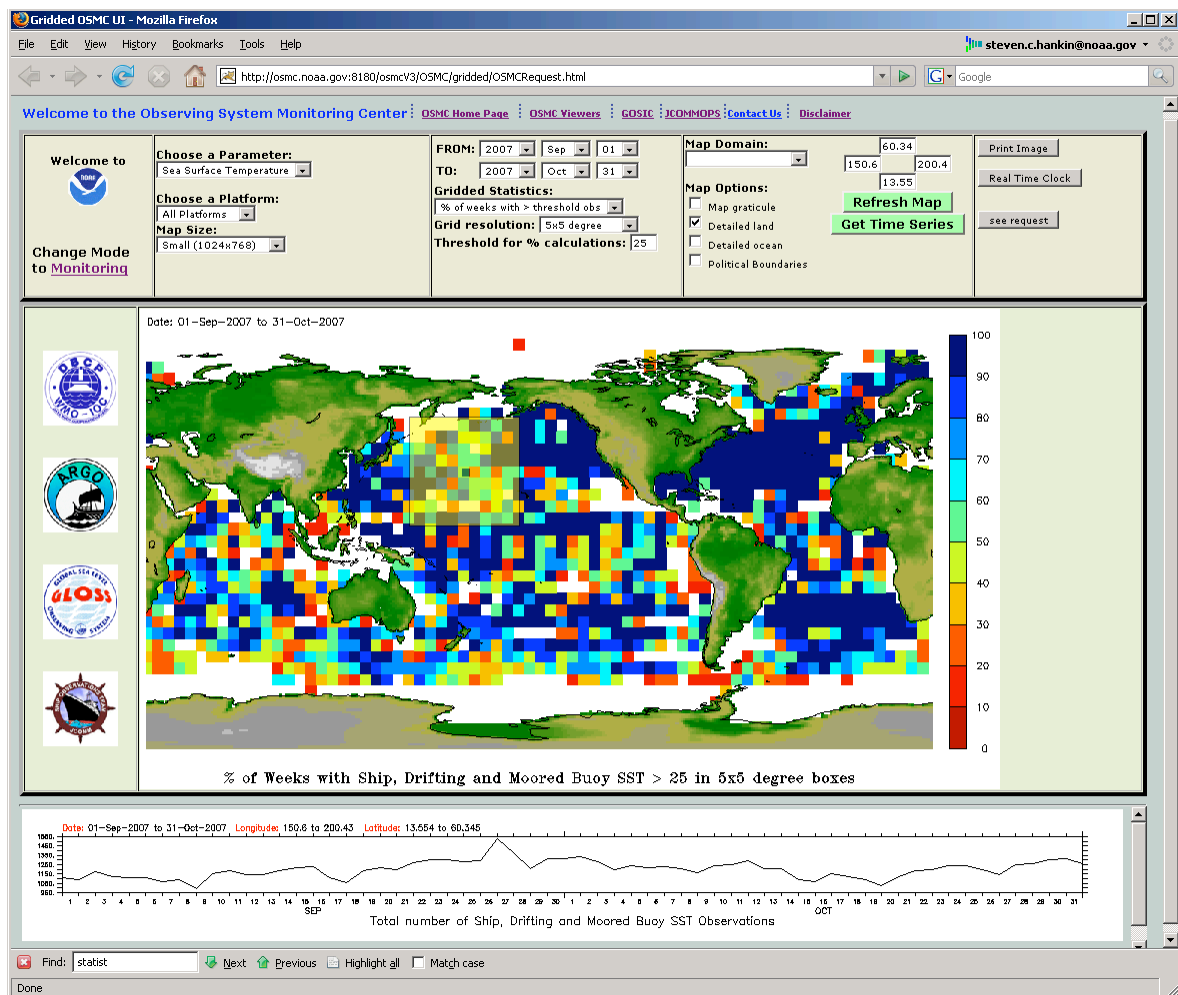
- Drifter-tail style of visualizations made to OCO specifications (the two images following are examples)
- Maps generated for the OSMC may be mapped to Google Earth®.



- Ability to track a particular platform by its WMO ID. In this example we see the path of WMO ID 41917 for the month of October, 2007.



- Recoding of all SQL queries from LAS to address the new database schema design of the OSMC
- “Clickable” text in the OSMC drill-down queries links to platform management sites
- Arbitrary zooming via “rubber band” into custom regions
- Numerous look and feel changes -- icons for organizations contributing to OSMC, progress bar, layout, response when query contains no data, etc.
- The OSMC was upgraded to use version 7 of LAS – a complete redesign of the system internals. Version 7 is approximately 6 times faster than the previous version (this performance measure excludes database access and rendering) and is much more flexible. It builds the foundation required for DMAC-style live access to remote data sources that will become available through web services.
- The Analysis subsystem for the OSMC LAS was fully integrated into the system in May, 2007 and improved upon in several increments since then. In the example here we see a map that provides a quantitative measure of the adequacy of sampling of in-situ SST, based upon a simple threshold of requiring 25 obs/week/5x5 degree cell. In the bottom frame of the figure we see a time series of the number of observations in the indicated region of the Pacific.



- The following platform types were added to the LAS viewer
 - tide gauges
 - includes NWLON, Real Time Reporting, GLOSS subtypes
 - dart buoys
 - ocean reference stations (not all ocean reference stations have been identified)
 - tropical moored buoys
 - weather buoys
 - unknown platforms (marked with a simple “+”)
- The following parameters were added to the LAS viewer
 - wave height
 - water temperature (profiles)
 - salinity (profiles)
 - wind speed
 - wind direction
- PMEL installed and set up a bug and issues tracking system for the OSMC project that has proven very helpful for group communications and tracking of progress.
- PMEL has assumed web primary responsibility for creating and editing the OSMC home page. The home page was made public during 2007 and advertised at several venues. A number of minor improvements were made subsequent to the initial release of the home page.

NDBC Accomplishments

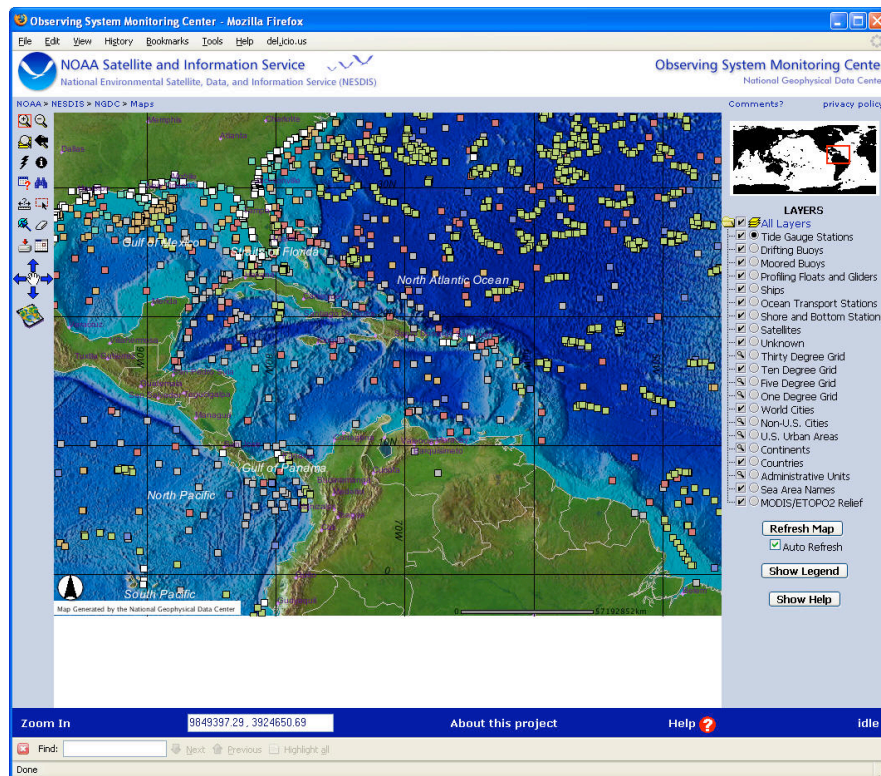
- Continued to update the OSMC Oracle database and NetCDF files with data from the following sources:
 - GODAE T-File
 - GTS feed from NWSTG
 - WMO Allocation table (Country info)
 - WMO Pub 47 data (meta-data)
 - JCOMOPS WMO Platform Cross-Reference (meta-data)
 - NDBC Website (meta-data)
- New data sources added
 - Migrated the existing data feeds (GODAE, WMO, JCOMMOPS, etc) to the new database schema
 - Migrated existing data to the new schema.
 - Started decoding XBT profile data
 - Added the GLOSS Tide Gauge data
 - Added wave height parameter and started populating field from the GTS data
 - Identified Tropical Moored Buoy and Weather Buoy assets
- Database technical enhancements

- Implemented the new database schema which was a joint design between NDBC, NGDC and PMEL.
- Added the Daily Summary table to the database
- Spatially enabled the database
- Added last report date in platform table
- Implemented time partitions
- Implemented materialized views
- Performed OSMC server upgrades and security patches as required

NGDC Accomplishments

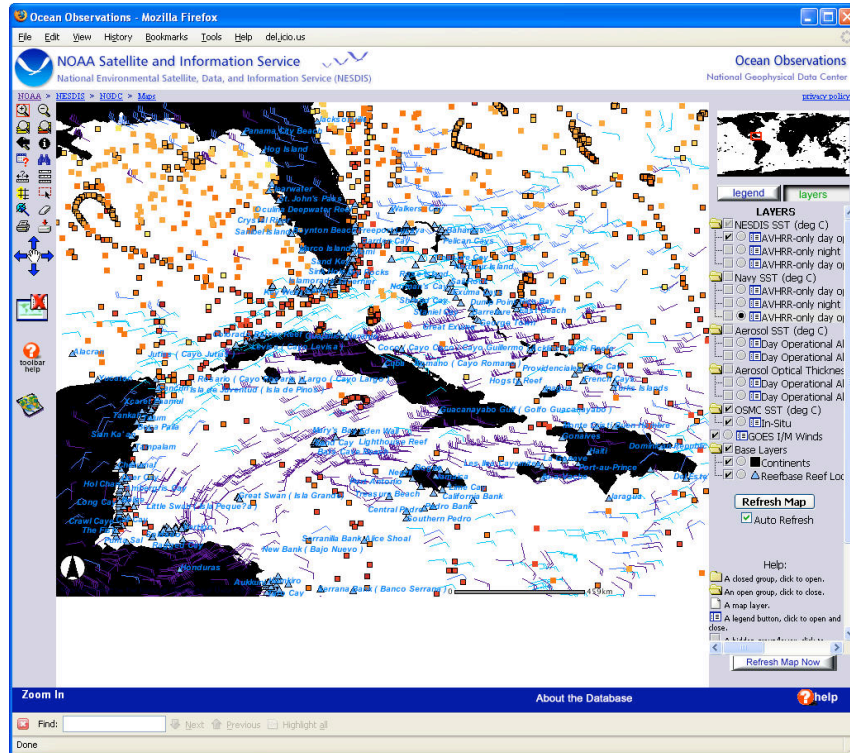
Task: Map Interfaces / Spatial Queries:

- The OSMC Interactive Map supported using ArcIMS at NGDC was used to draw an average of 233 maps / month during FY06.
- A new "next-generation" ArcIMS viewer was created that displays the locations of the last reported observation by a platform on each of the 10 most recent days by platform type.
http://mapdevel.ngdc.noaa.gov/website/auerbach/2.0/osmc_gts There is also a hyperlink to a web interface table showing the parameters and their values measured in this most recent observation of the day. In the viewer, you can restrict the rendering of the data using a date constraint.



- An interactive map viewer was created that included OSMC observations, sea surface temperature and aerosol thickness observations from NPOESS satellites, wind speeds from

GOES, and coral reef locations from ReefWatch (see Figure). This map service demonstrated the capability to integrate OSMC data with NOAA satellite observations and potentially interesting geographic datasets. It also allowed users to download all of the data layers for some region and time.



- A text interface that allows users to find OSMC observations within 50km of any Coral Reef in the world was demonstrated.

Reefbase OSMC Selection - Mozilla Firefox

NOAA > NESDIS > NGDC

NOAA Satellite and Information Service
National Environmental Satellite, Data, and Information Service (NESDIS)

Search NGDC Search NOAA

OSMC Platforms within 50 km of Selected Reef

Platform ID	Observation Date	Platform Type	Platform Observations	Platform Description
41692	2007/11/01	DRIFTING BUOY	Get Data	Get Description
KS004	2007/11/02	UNKNOWN	Get Data	Get Description
ZCDG8	2007/11/03	SHIP	Get Data	Get Description

NOAA > NESDIS > NGDC

questions: ngdc.info@noaa.gov

[home](#) | [comments](#) | [contacts](#) | [data](#) | [disclaimers](#) | [education](#) | [news](#) | [products](#) | [site map](#)

page maintained by: ngdc.info@noaa.gov

Find: km Next Previous Highlight all Match case Phrase not found

Done

- We have an operational 10-day revolving window of the new "production" database schema tables (which is a combination of data reported on both the GTS and GODAE datafeeds), plus views pointing to the "production" and "test" tables of the entire databases at NDBC.
- We have provided web-view access to "latest observation" data in the ArcIMS viewer (described above) or through a text interface, e.g. for platform_code '21542':
http://www.ngdc.noaa.gov/idb/struts/results?&op_7=eq&v_7=21546&t=102723&s=14&d=14. This view demonstrates some quality problems associated with differences in the precisions of locations reported by GTS and GODAE.
- We provide a map and text view that shows locations without ARGO observations during the most recent 5 days as an example of spatial capabilities with map and text output. See <http://www.ngdc.noaa.gov/idb/struts/results?&t=102753&s=5&d=5>.

Task: Support smooth transition and operation of OSMC database at NDBC

- We provided the database design and DDL for instantiating the new database schema at NDBC and developed, tested, and provided code to transition the old data to the new.
- Provided general database advice to NDBC on loading performance and database layout.
- Created a TRAC wiki page for database items that includes: LAS database query coding, Performance issue discussions, Platform Hierarchy correction/enhancement code (also listed below, re: optimization), Database QC findings, New database design requirements
- Temporal partitioning is in place in the observation and observation_value tables.
- Numerous queries have been examined, tested, and optimized using our 10 day database, e.g. <https://intranet.ngdc.noaa.gov/wiki/index.php?title=OsmcQueryA>
 - We have researched creating a decision-tree query approach.
<https://intranet.ngdc.noaa.gov/wiki/index.php?title=OsmcLas>
 - We have researched creating a 10-day all-table-join table and queries.
<https://access.pmel.noaa.gov/trac/osmc/wiki/OSMCLasDatabaseQueryCode,DanaInfo=porter.pmel.noaa.gov+https://intranet.ngdc.noaa.gov/wiki/index.php?title=OsmcAllTableJoin>
 - We have researched translating "plain-language" queries.
<https://access.pmel.noaa.gov/trac/osmc/wiki/OSMCLasDatabaseQueries,DanaInfo=porter.pmel.noaa.gov+https://access.pmel.noaa.gov/trac/osmc/wiki/OSMCLasDatabaseQueryCode,DanaInfo=porter.pmel.noaa.gov+>
 - We have researched correcting the platform_table hierarchical search capabilities.
<https://access.pmel.noaa.gov/trac/osmc/wiki/PlatformHierarchy,DanaInfo=porter.pmel.noaa.gov+>
- We have created a number of text query interfaces:
 - Current classification of all platforms listed in the OSMC.PLATFORM table, regardless of reporting activity.
<http://www.ngdc.noaa.gov/idb/struts/results?&t=102760&s=13&d=13>

GTS vs. GODAE Daily Count Comparison - Mozilla Firefox

File Edit View History Bookmarks Tools Help deljco.us

NESDIS Rich Inventory - N... Index of /LogAnalysis/Web... OsmcQueryA - Intranet GTS vs. GODAE Daily C... CA Stovepipe Wells 1 SW: ...

GTS vs. GODAE Daily Count Comparison

Platform Code				Daily Observation Count		Platform Type		Observation Day	
GTS	GODAE	GTS	GODAE	GTS	GODAE	GTS	GODAE	GTS	GODAE
13008	13008	7	9	CLIMATE REFERENCE MOORED BUOYS	MOORED BUOY	2007-11-03	2007-11-03		
15001	15001	8	11	CLIMATE REFERENCE MOORED BUOYS	MOORED BUOY	2007-11-03	2007-11-03		
28400	28400	7	9	CLIMATE REFERENCE MOORED BUOYS	MOORED BUOY	2007-11-03	2007-11-03		
31007	31007	9	11	CLIMATE REFERENCE MOORED BUOYS	MOORED BUOY	2007-11-03	2007-11-03		
32323	32323	8	10	CLIMATE REFERENCE MOORED BUOYS	MOORED BUOY	2007-11-03	2007-11-03		
KEO		1		CLIMATE REFERENCE MOORED BUOYS		1970-01-01			
11902	11902	18	21	DRIFTING BUOYS	DRIFTING BUOY	2007-11-03	2007-11-03		
11903	11903	18	21	DRIFTING BUOYS	DRIFTING BUOY	2007-11-03	2007-11-03		
11904	11904	24	27	DRIFTING BUOYS	DRIFTING BUOY	2007-11-03	2007-11-03		
11905	11905	17	20	DRIFTING BUOYS	DRIFTING BUOY	2007-11-03	2007-11-03		
11922	11922	17	21	DRIFTING BUOYS	DRIFTING BUOY	2007-11-03	2007-11-03		
11924	11924	15	18	DRIFTING BUOYS	DRIFTING BUOY	2007-11-03	2007-11-03		
11925	11925	21	24	DRIFTING BUOYS	DRIFTING BUOY	2007-11-03	2007-11-03		
11926	11926	19	20	DRIFTING BUOYS	DRIFTING BUOY	2007-11-03	2007-11-03		
11927	11927	18	21	DRIFTING BUOYS	DRIFTING BUOY	2007-11-03	2007-11-03		
11928	11928	18	20	DRIFTING BUOYS	DRIFTING BUOY	2007-11-03	2007-11-03		
11929	11929	16	19	DRIFTING BUOYS	DRIFTING BUOY	2007-11-03	2007-11-03		
11930	11930	16	18	DRIFTING BUOYS	DRIFTING BUOY	2007-11-03	2007-11-03		
11931	11931	19	21	DRIFTING BUOYS	DRIFTING BUOY	2007-11-03	2007-11-03		
11932	11932	21	24	DRIFTING BUOYS	DRIFTING BUOY	2007-11-03	2007-11-03		
11933	11933	21	24	DRIFTING BUOYS	DRIFTING BUOY	2007-11-03	2007-11-03		
11934	11934	21	24	DRIFTING BUOYS	DRIFTING BUOY	2007-11-03	2007-11-03		
11935	11935	21	24	DRIFTING BUOYS	DRIFTING BUOY	2007-11-03	2007-11-03		
13516	13516	16	19	DRIFTING BUOYS	DRIFTING BUOY	2007-11-03	2007-11-03		

Find: Done

- GTS feed vs. GODAE feed -- Daily Count Comparison
(Individual platform_codes comparison--includes unidentified platforms)
<http://www.ngdc.noaa.gov/idb/struts/results?&t=102734&s=6&d=6>
 - GTS vs. GODAE platform type and subtype count comparisons
<http://www.ngdc.noaa.gov/idb/struts/results?&t=102734&s=6&d=10,7>
<http://www.ngdc.noaa.gov/idb/struts/results?&t=102734&s=6&d=10&d=11>
 - GODAE platforms not in GTS
<http://www.ngdc.noaa.gov/idb/struts/results?&t=102734&s=4&d=8,4>
 - GTS platforms not in GODAE
<http://www.ngdc.noaa.gov/idb/struts/results?&t=102734&s=5&d=9,5>
- We have used the “date_added” field in the OSMC database to characterize reporting histories and identify reporting anomalies. As of May 18, 2007, this field should be accurately populated. Up until that time, there were various influxes of data where the date_added field was set to be equal to the observation_date field) (e.g. the conversion of the "historic" data to the new schema and before 05/18, the date_added field was not being populated. Since 05/18, it should be correctly populated. The latency results look like:

Days	Count	Days	Count	Days	Count
0	33993845	15	152551	30	44390
1	18754835	16	90598	31	39182
2	1330285	17	98424	32	44501
3	1138827	18	100253	33	31545
4	295100	19	96785	34	4856
5	186579	20	115304	35	38034

6	189586	21	133394	36	41038
7	214612	22	95168	37	41045
8	124316	23	97193	38	35936
9	144218	24	95143	39	38934
10	107203	25	74566	40	39040
11	100026	26	95277	41	36756
12	153758	27	112402	42	43538
13	104700	28	140165	43	38428
14	101782	29	74425	44	33728

- Support access to recent OSMC data using Open Geospatial Consortium web services (WMS, WFS).

Acronyms

ArcIMS	Arc Internet Map Server
DDL	Data Definition Language
ESRI	Environmental Systems Research Institute
FTE	Full Time Equivalent
FY	Fiscal Year
GEO-IDE	NOAA's Global Earth Observation Integrated Data Environment
GIS	Geographic Information Systems
GODAE	Global Ocean Data Assimilation Experiment
JCOMMOPS	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology Observing Platform Support
LAS	Live Access Server
NDBC	National Data Buoy Center
NGDC	National Geophysical Data Center
NOAA	National Oceanic and Atmospheric Administration
MS	Microsoft
OCO	Office of Climate Observations
OSMC	Observing Systems Monitoring Center
PMEL	Pacific Marine Environmental Laboratory
PP&I	Program, Planning & Integration
SDE	Spatial Database Engine
WMS	Web Map Service
WFS	Web Feature Service